2016

Evaluation of Different Byproduct Combinations along with Treated Corn Stover on Growing Steer Performance

Kristen M. Ulmer
University of Nebraska-Lincoln, kristen.ulmer@unl.edu

Curtis J. Bittner
University of Nebraska-Lincoln, curtis.bittner@unl.edu

F. Henry Hilscher Hilscher
University of Nebraska-Lincoln, henry.hilscher@unl.edu

Galen E. Erickson
University of Nebraska-Lincoln, gerickson4@unl.edu

James C. MacDonald
West Texas A&M University, jmacdonald2@unl.edu

Evaluation of Different Byproduct Combinations along with Treated Corn Stover on Growing Steer Performance

Kristen M. Ulmer, Curtis J. Bittner, F. Henry Hilscher, Galen E. Erickson, and James C. MacDonald

Summary

A growing study was conducted to determine the effects of maximizing the energy density of treated corn stover through feed component additions. Calves fed 46% brome hay diet with treated corn stover and varying amounts of solubles or glycerin had greater dry matter intake, but lower average daily gain compared to calves fed modified distillers grains. Calcium oxide treated corn stover treatments also had lower feed to gain and ending body weight than control calves fed distillers grains. Displacing protein as solubles or fat as glycerin in a treated corn stover feed did not provide the same feeding value as distillers grains.

Introduction

With a large supply of distillers grains plus solubles (DGS), opportunities exist for growing cattle. Utilization of increasingly available corn residue is another opportunity. A previous growing study evaluated the different components of DGS in comparison to calcium oxide (CaO) treated stover; feeding the treated stover product with isolated DGS ingredients did not provide the same performance as bran (*2016 Nebraska Beef Cattle Report*, pp. 128–31). This raises the question if other feed additives, such as solubles or glycerin, are able to increase the energy density of the stover product to be equal to DGS in growing cattle diets. The objectives of this study were to evaluate the CaO treated corn stover product compared to DGS, characterize the effects of increasing the concentration of distillers solubles level, and determine if crude glycerin could further improve growing cattle performance.

Procedure

An 81-day growing study utilized 300 yearling crossbred steers (initial BW = 684, SD = 33 lb) in a randomized block design at the University of Nebraska-Lincoln Agricultural Research and Development Center (ARDC). Steers were limit fed a 50:50 Sweet Bran® and alfalfa hay diet at 2% of BW for 5 days prior to and upon completion of the trial to reduce the effects of gut fill on weights. Two consecutive day weights were collected and averaged to determine initial BW and ending BW. Steers were poured with StandGuard® on day 0 and implanted with Ralgro® on day 1 of the trial. The steers were blocked into 1 of 2 blocks based on the first day weight. The heavy weight block had 1 replication (initial BW = 761 lb) and the light weight block had 4 replications (initial BW = 653 lb). Within a block, cattle were stratified by BW, assigned randomly to pen with 15 head per pen and five replications per treatment.

All diets had a 46% brome hay base (11% CP, 2% ether extract (EE), 77% NDF, 92% OM) and 4% supplement with 200 mg/hd/day (DM basis) Rumensin®. Treatments imposed on the remaining 50% of the diet: 1) the control diet (CON) contained 50% modified distillers grains plus solubles (MDGS); 2) product A (ProdA) consisted of 18.75% solubles, 12.50% treated stover, 18.75% high-protein distillers; 3) product B (ProdB) consisted of 30% solubles, 12.50% treated stover, 7.50% high-protein distillers; 4) product C (ProdC) consisted of 25% solubles, 5% glycerol, 12.50% treated stover, 7.50% high protein distillers. The nutrient content of each treated corn stover product is listed in Table 1. Diets were formulated to meet RDP requirements and were supplemented with urea if deficient. ProdB had 0.74% urea (DM basis) and ProdC had 1.13% urea (DM basis) added to the supplement to match ProdA RDP supply. Feed samples were analyzed each month to determine nutrient composition.

Performance data (BW, DMI, ADG, G:F) were analyzed with the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.) with pen as the experimental unit and block treated as fixed effect. One steer died during the study of cause unrelated to the dietary treatments administered and was removed from the data set.

Results

Diets containing CaO treated stover (ProdA, ProdB, ProdC) had lower ADG than CON calves fed MDGS ($P < 0.01$). As a result, CON calves had greater ending BW ($P < 0.01$) than ProdA, ProdB, or ProdC (Table 2).

Similar ending BW was observed for all 3 treated corn stover diets ($P > 0.25$). Treatment ProdA, with more DDGS, had similar DMI to ProdC ($P = 0.12$), but lower DMI as compared to ProdB, which had 30% solubles and 7.50% DDGS ($P = 0.01$). There was no difference in ADG among the 3 products ($P \geq 0.40$). As a result, feed conversion for ProdB was poorer than ProdA. The hypothesis was that displacing DGS with solubles would improve the feeding value of the treated corn stover product. These data do not support the hypothesis. The addition of solubles may have made

Table 1. Nutrient composition of CaO treated products (DM basis)[a]

Nutrient	ProdA	ProdB	ProdC
OM, %	85.0	81.0	82.0
CP, %	27.8	25.6	24.7
NDF, %	41.8	39.5	43.2
ADF, %	28.8	27.2	30.0
EE, %	**6.67**	**6.55**	**5.51**

[a]Nutrient content of CaO treated stover products prior to inclusion in diet

Table 2. Effects of solubles and glycerin additions to CaO treated corn stover diets on cattle performance

	Treatment[a]				SEM	*P*-value
	CON	ProdA	ProdB	ProdC		
Initial BW, lb	703	704	703	705	0.90	0.30
Ending BW, lb	992[c]	954[d]	948[d]	955[d]	4.78	< 0.01
DMI, lb/d	23.5[c]	23.8[c]	25.0[d]	24.5[c,d]	0.30	0.01
ADG, lb	3.56[c]	3.08[d]	3.02[d]	3.09[d]	0.06	< 0.01
Feed:Gain[b]	6.58[c]	7.72[d]	8.30[e]	7.92[d,e]	—	< 0.01

[a]CON = 50% MDGS; ProdA = 18.75% solubles, 12.50% treated stover, 18.75% high-protein DDG; ProdB = 30% solubles, 12.50% treated corn stover, 7.50% high-protein DDG; ProdC = 25% solubles, 12.50% treated stover, 7.50% high-protein DDG, 5% glycerin; Each treatment also contained 46% brome hay and 4% supplement.
[b]Analyzed Gain:Feed, the reciprocal of F:G
[c,d,e]Means within a row with different superscripts differ ($P < 0.05$)

Table 3: Ingredient composition of diet fed to growing steers (DM basis)

Ingredient	Treatment			
	CON	ProdA	ProdB	ProdC
Brome hay	46.00	46.00	46.00	46.00
MDGS[a]	50.00	—	—	—
Solubles	—	18.75	30.00	25.00
Glycerin	—	—	—	5.00
Treated Stover	—	12.50	12.50	12.50
High-Protein DDG[b]	—	18.75	7.50	7.50
Supplement[c]			—	—
Fine ground corn	2.101	2.101	1.487	1.479
Limestone	1.424	1.424	1.300	1.130
Urea	—	—	0.740	0.918
Salt	0.300	0.300	0.300	0.300
Tallow	0.100	0.100	0.100	0.100
Pre-mix, Tr. Mineral[d]	0.050	0.050	0.050	0.050
Premix, Vitamin[e]	0.015	0.015	0.015	0.015
Rumensin[f]	0.010	0.010	0.008	0.008
Nutrient Composition				
OM, %	88.4	86.9	84.9	85.9
CP, %	22.0	19.0	20.0	20.6
NDF, %	55.5	56.4	55.2	57.1
ADF, %	30.0	36.5	35.7	36.9
Ether Extract, %	5.21	4.05	3.99	3.47
Ca, %	0.95	1.58	1.60	1.44
S, %	0.413	0.366	0.453	0.390

[a]MDGS = modified distillers grains with solubles
[b]High-protein DDG = High-protein dried distillers grain plus solubles
[c]Supplement comprised 4% of dietary DM
[d]Premix contained 10% Mg, 6% Zn, 4.5% Fe, 2% Mn, 0.5% Cu, 0.3% I, and 0.05% Co
[e]Premix contained 1,500 IU of vitamin A, 3,000 IU of vitamin D, and 3.7 IU of vitamin E·g-1
[f]Formulated to supply 200 mg/head/day

the treated corn stover more palatable, resulting in increased DMI. However, solubles did not provide comparable energy to distillers grains in these growing diets. The addition of crude glycerin in ProdC did not significantly improve performance over ProdB with more solubles. However, there was a tendency for an improvement in feed conversion, 4.6% due to replacing 5% of the solubles with glycerin (ProdC compared to ProdB; $P = 0.12$).

As DGS were displaced by CaO treated corn stover in the diet, NDF content increased 1% and 2% for ProdA and ProdC, respectively, compared to the CON diet (Table 3). As DGS were displaced with the CaO treated stover product, the CP content decreased, in addition, ProdB and ProdC had a 1% increase in CP as solubles were increased compared to ProdA. As treated stover displaced DGS, the ADF content increased in ProdA. ProdB, and ProdC compared to CON. Calcium content was greater in treated stover product diets than CON, but remained similar among treated stover products. S content increased as solubles were added to the diet, but across the diets, the S content averaged 0.41%.

Utilizing up to 30% solubles, 5% glycerin, and 12.50% CaO treated stover to displace DGS in a brome hay diet did not provide the same performance or feeding value as MDGS. Increasing the amount of solubles increased intake, but decreased efficiency. Replacing 5% of the solubles with glycerin did not improve calf performance, except for a slight tendency for improved feed conversion.

Kristen M. Ulmer, graduate student
Curtis J. Bittner, research technician
F. Henry Hilscher, research technician
Galen E. Erickson, professor
James C. MacDonald, associate professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, NE